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The reports aroused interest and were followed by lively discussion.

The Russian text of this report will be published under the title "Вторая школа по истории математики" in the journal Вопросы истории естествознания и техники.

WORKSHOP ON THE SOCIAL HISTORY OF MATHEMATICS

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A meeting on the social history of 19th-century mathematics was held in West Berlin, July 5 to 8, 1979. The workshop was organized by the Institut für Philosophie, Wissenschaftstheorie, Wissenschafts- und Technikgeschichte of the Technische Universität Berlin, and sponsored by the Stiftung Volkswagenwerk and Project PAREX, a European programme of cooperative research in the social studies of science. Participants came from Canada, Denmark, France, Italy, the Netherlands, the United Kingdom, the United States, and West Germany. They represented the fields of the history of mathematics and physics, pedagogy of mathematics, philosophy, and the sociology of science.

The workshop was the third in a series of meetings commonly sponsored by project PAREX, devoted to the sociology and social history of mathematics [1]. The purpose of the meeting was the discussion--in a large, interdisciplinary group--of the subject, methods, and results of the social history of mathematics. An attempt was also made to develop a perspective for future research and cooperation. Since research in the field is strongly concentrated on mathematics in the 19th century, the workshop was devoted to this period.

Besides a survey lecture by Dirk J. Struik (MIT), "Mathematics in the Early 19th Century," the following papers were presented:

H. Mehrtens	Social History of Mathematics: Some Remarks on Problems and Methods
D. Bloor	Did Hamilton's Metaphysics Influence His Algebra?
N. Jahnke u. M. Otte	Zum Gegenstandsverständnis der Mathematik frühen 19. Jahrhundert: Thesen zum Problem zum Kontext der Arithmetisierung der Mathematische

L. Rogers	The 19th Century Mathematics Curriculum: Social and Economic Determinants
I. Schneider	Forms of Professionalization in Mathematics before the 19th Century
G. Schubring	The Conception of Pure Mathematics as an Instrument for the Professionalization of Mathematics
L. Pyenson	Revolution from Below: Mathematicians and Physicists in Wilhelmian Germany
I. Grattan-Guinness	Mathematical Physics in France, 1800-1840: Knowledge, Activity, and Historiography
L. Hodgkin	Mathematics and Revolution from Lacroix to Cauchy
P. Enros	Cambridge University and the Adoption of Analytics in Early 19th Century England
D. MacKenzie	Scottish Mathematics--A Sociological Exploration
T. Hawkins	The Berlin School of Mathematics
A. C. Lewis	The Influence of F. Schleiermacher's Theology on H. Grassman and the Historian
U. Bottazzini	Mathematics in a Unified Italy

A paper by H. E. Gross, "Einsatz von Mathematikern in Versicherungsunternehmen im 19. Jahrhundert," was distributed during the meeting, the author not being present.

Work in small groups was devoted to the following topics:

- Mathematics in early 19th century,
- The professionalization of mathematics,
- Methods and research programs of the social history of mathematics

The results of each group discussion were reported to the workshop and discussed there. The meeting closed with a summary given by Henk Bos. Most of the papers had been distributed before the meeting, and discussions were recorded. Publication of the proceedings is planned.

The meeting took place in a lively and intense work atmosphere Discussions were limited neither to questions of a purely social character nor to the 19th century. Furthermore, they included much exchange of opinions on matters of method and theory. The survey by Struik gave a vivid impression of the basic changes in mathematics since the French Revolution, which included changes in content, in self-understanding, in the social structure, and in the role of mathematics in society. These changes are embedded in the political, social, economical, and cultural transformations

which took place during the age of revolution. A central feature in the social history of mathematics was the creation or reformation of the system of higher education. Mathematicians either found or tried to find their new social role in that system. This was connected with the engagement of mathematicians in reform movements (Bottazzini, Enros, Pyenson, Rogers, Schubring), with state intervention (Bottazzini, Schubring), and with new concepts of mathematics such as, for instance, the dominance of "pure" mathematics (Schubring) and the new, theoretical relationship of mathematics to its applications (Jahnke/Otte). A recurring theme during the conference was the question of the influence of teaching on research (Hodgkin, Enros). The central historical role of the École Polytechnique in France and other countries was strongly emphasized (Grattan-Guinness, Hodgkin). At the same time it was pointed out that, while there have been attempts to create a professional role for the mathematician (generally in teaching positions) in most countries, the philosophies of education developed in that connection have varied in content and effect. Whereas the concept of liberal education at Cambridge University adversely affected the development of mathematics in the long run (Enros), the neo-humanist and idealist philosophy in Germany exerted a very positive influence on the development of science, including mathematics.

Comparative studies might shed more light on this, especially if the social conditions for the reception of different philosophies are considered. In this connection, the study of individual achievements and their roots is also important, particularly in cases of scientific controversy (Bloor) or of outsiders like Grassmann (Lewis). "Schools" of mathematical thought play an important role in the history of mathematics, and they were frequently discussed during the workshop. Apart from their general impact, as in the case of the Königsberg school of Jacobi or the Cambridge School (Enros), their influence must also be considered with respect to theoretical development (Hawkins). The discussion on mathematics at the end of the 19th century centered on the person of Felix Klein. The changes that took place then may well be seen as also resulting from changes in the educational system (Pyenson).

The participants agreed on the importance of the themes mentioned and stated that all these topics required further research There was less agreement concerning the possibility of establishing connections between the political and social aims of social strata, groups of intellectuals, mathematicians, or even individual scholars and the development of mathematical theories or concepts of mathematics. Although connections of this kind were made plausible in some cases (Bloor, Enros, MacKenzie), they were not commonly accepted as convincing, and this gave rise to discussions on method and theory.

Opinions, during these discussions, can be regarded as split, roughly speaking, between "theoreticians" and "empiricists," the latter representing an approach with its central aim a clear and convincing description of historical events. The former are more interested in theoretical explanations and their development. Another division is that between "internalism" and "externalism," one side preferring explanations through mathematics itself, the other stressing the necessity of incorporating social explanations, as well as extending the scope of the history of mathematics to include social phenomena, for example, studying the artisan-like mathematical professions of the 17th century (Schneider), the rather "unscientific" work of mathematicians in insurance companies (Gross), or the whole "epistemological field" of mathematical discourse (Hodgkin, with reference to Foucault).

The discussion showed, however, that this was hardly the "classical" internal vs external debate. Possibilities of constructive complementarity of approaches were visible, as in the consideration of social factors in the historiography of theoretical developments (Hawkins), or in the stress placed on the development of knowledge as a frame of reference for the social history of mathematics (Mehrtens). Participants agreed upon the rejection of sociological or disciplinary reductionism in historiography. It was also commonly agreed that theories, explanatory models, and concepts must be developed and examined because they are needed in historiography. They cannot, on the other hand, find a sharp and universally valid definition in historiographical work, and must be specified according to the subject studied. This applies, for example, to the concept of "profession," which has to be taken differently for different periods to allow for an adequate historical reconstruction. Similarly "mathematics" and "mathematicians" are concepts of a historical nature, insofar as they must be defined for the period under consideration so that they reflect the self-understanding of the mathematicians of the time. Then, however, the particular traits of the time also require historical explanations. There were differing conceptions of the degrees of generality and theoretical precision needed for such concepts and models. A much discussed explanatory approach was that of David Bloor, who argued, on grounds of the scope of interpretative freedom, which applies also to mathematics, that concept and theories carry a social or political message. The basic objectivity of mathematics was not questioned, albeit its nature remained unsolved. Bloor's approach was criticized as lacking methodological foundation and theoretical precision. The view was held, on the other hand, that this was a case of research aimed at a detailed model of explanation, a convincing historical description as well as the development of methodological criteria. This was one of the topics which initiated the discussion of methods of, and approaches to, the social history of science.

Summarizing, one could say that the social history of mathematics was shown to be a lively, interdisciplinary field of study, in which different approaches and aims can fruitfully supplement each other. The meeting showed that matters of social historiography serve a variety of functions in the history of mathematics. Although there is still little discussion of methods and of the adequacy and completeness of historical reconstructions, the experience of the workshop provides hope that precisely such a discussion would serve the development of an integral historiography of mathematics, and thus end the unfruitful controversy between externalists and internalists. This integral historiography should include the relationships of mathematics to the general movements in society, economy, culture, and politics. This was made particularly clear in the contributions of Dirk J. Struik. "I interpret," said Henk Bos in his summary, "this example of Dirk Struik as a reminder that what we are doing, social history of mathematics, is more than just an academic discipline remote from anything else; it is part of understanding the great movements in general history which still affect us today."

NOTE

[1] For reports see *Historia Mathematica* 3 (1976), 470-471; 5 (1978), 141-142; *Social Studies of Science* 8 (1978), 141-142; *PAREX Information* 2 (1977) 3-4; 3 (Dec. 1977), 13-14.

A WORKSHOP ON THE GROWTH OF QUANTUM MECHANICS

A workshop on the Growth of Quantum Mechanics in the 20's, and the Cultural, Economic, and Social Context of the Weimar Republic and of the United States, organized by the University of Lecce and of Rome, was held in Lecce, Italy, September 3-6, 1979. A list of the papers read at the workshop and their authors follows.

Kausalität, Auschaulichkeit und Individualität; or, how Cultural Values Prescribed the Character and Lessons Ascribed to the Quantum Mechanics, Paul Forman

Quantum Mechanics and the Mathematical Environment: Changes of Points of View and Institutional Aspects, Tito Tonietti

Capitalistic Development in the 20's: Aspects of the Growth of American Capitalism and Its Relationship to German Industrial Development, Ester Fano

Physics in the United States before Quantum Mechanics, John L. Heilbron

Scientific and Contextual Aspects in the Passage of Quantum Mechanics to the United States, Elisabetta Donini

The Transmission to and Impact of Quantum Mechanics in the U.S.A.: Institutional Aspects, Robert W. Seidel